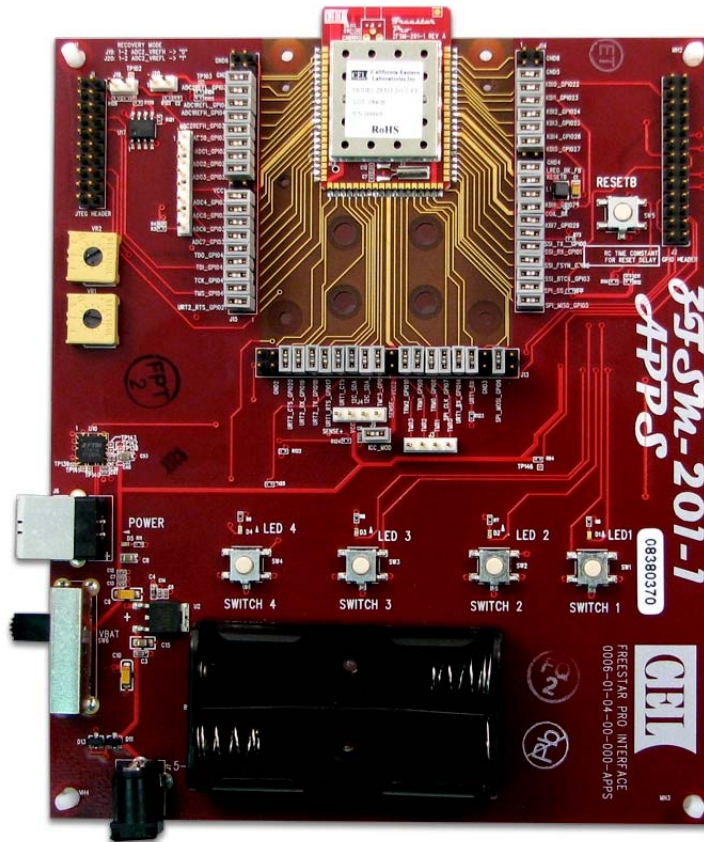


## ZFSM-201-EVB-1 Evaluation Board BeeKit™ Porting Guide



## ZFSM-201-1 FreeStar Pro Module

Document # 0006-00-08-03-000

(Rev B)

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# 1 OVERVIEW

## 1.1 DESCRIPTION

One method to begin code development is to use the project supplied on the CD included in the **ZFSM-201-KIT-1** FreeStar Pro Evaluation Kit. Other users of the **ZFSM-201-1** FreeStar Pro Module may wish to start their code development with a fresh project generated by the Freescale **BeeKit™**. This document will guide users through creating a project in **BeeKit™** that will be compatible with the **ZFSM201-EVB-1** FreeStar Pro Evaluation Board.

This document should not be considered a substitute to documentation on **BeeKit™** provided by Freescale. Users are encouraged to consider the Freescale documentation on **BeeKit™** and to become thoroughly familiar with it.

## 1.2 REFERENCED DOCUMENTS

Table 1 contains the documents that have been referenced by this document (or recommended as additional information). Please consult the appropriate website to check for the latest revisions and editions.

**Table 1 – Related and Referenced Documents**

<u>Document Title</u>	<u>Document Name / Number</u>
<b>Freescale Semiconductor Documents</b> ( <a href="http://www.freescale.com">www.freescale.com</a> )	
<b>BeeKit™</b> Wireless Connectivity Toolkit Quick Start Guide	BKWCTKQSG
<b>BeeKit™</b> Wireless Connectivity Toolkit User's Guide	BKWCTKUG
<b>BeeKit™</b> Wireless Connectivity Toolkit Software Release Notes	BKWCTKRN
<b>MC13224V</b> Datasheet	MC1322x
<b>MC1322x</b> Reference Manual	MC1322xRM
<b>MC1322x</b> Software Driver Reference Manual	22XDRVRRM
<b>MC1322x</b> Simple Media Access Controller (SMAC) Reference Manual	22xSMACRM
802.15.4 Media Access Controller (MAC) MyWirelessApp	802154MWAUG
802.15.4 Media Access Controller (MAC) MyStarNetworkApp	802154MSNAUG
802.15.4 MAC PHY Software Reference Manual	802154MPSRM
Simple Media Access Controller (SMAC) User's Guide	SMACRM
Freescale <b>Test Tool</b> User's Guide	TTUG
<b>Note:</b> The Freescale documents listed above will be loaded to the user's PC when installing the <b>BeeKit™</b> Toolkit found on the CEL Freestar Pro CD (see Section 2.3.3)	
<b>CEL Documents</b> ( <a href="http://www.cel.com">www.cel.com</a> )	
<b>ZFSM-201-1</b> Datasheet	0006-00-07-00-000
<b>ZFSM-201-KIT-1</b> Development Kit User Guide	0006-00-08-00-000
<b>ZFSM-201-EVB-1</b> Evaluation Board Host Serial & RF Protocol Guide	0006-00-08-01-000
<b>ZFSM-201-EVB-1</b> Evaluation Board SMAC Programmers Guide	0006-00-08-02-000
<b>ZFSM-201-EVB-1</b> Evaluation Board BeeKit™ Porting Guide	0006-00-08-03-000
<b>ZFSM-201-EVB-1</b> Evaluation Board MAC Programmers Guide	0006-00-08-05-000
<b>ZFSM-201-KIT-1</b> Wireless UART Application User Guide	0006-00-08-06-000
<b>ZFSM-201-KIT-1</b> , <b>ZFSM-201-EVB-1</b> Erratum	0006-00-08-04-000
<b>Note:</b> The CEL documents listed above are included on the CEL CD.	

## 2 USING FREESCALE SEMICONDUCTOR'S *BEEKIT*™

### 2.1 *BEEKIT*™

**BeeKit**™ is a software utility from Freescale used to select Codebases, configure settings regarding a wireless network, select software libraries, and select application templates. Version 1.9.5 dated 03/2009 was used to create the accompanying firmware for the evaluation boards.

#### 2.1.1 *More Information*

See Freescale documents Freescale Semiconductors' "**BeeKit**™ *Wireless Connectivity Toolkit Quick Start Guide*" (Freescale Doc # BKWCTKQSG) and "**BeeKit**™ *Wireless Connectivity Toolkit User's Guide*" (Freescale Doc # BKWCTKUG) for more information about **BeeKit**™.

**Note:** If the Utility described in Section 2.3.3 is used to download **BeeKit**™, then these files can be found on the user's PC in the directory C:\Program Files\Freescale\Documentation\BeeKit Documentation\

### 2.2 CODEBASES

#### 2.2.1 *Codebases For The MC1322x.*

- **SMAC** – Simple MAC
- **MAC** – IEEE 802.15.4 compliant MAC
- **BeeStack** – ZigBee Layer added to IEEE 802.15.4 MAC

This document and release of software specifically pertain to the SMAC and MAC for ARM7. With the exception of the selecting the target codebase the steps outlined here pertain to all codebases.

When building a new project using the **BeeKit**™ it is recommended to use the latest codebase. See [www.freescale.com/zigbee](http://www.freescale.com/zigbee) for the latest codebases and documentation.

### 2.3 INSTALLING *BEEKIT*™

#### 2.3.1 *Prerequisites*

The system requirements, disc space requirements, and configuration recommendations for **BeeKit**™ are contained in the Release Notes document "**Freescale BeeKit**™ *Wireless Connectivity Toolkit Software Version Release Notes*" (Freescale Doc # BKWCTKRN) which is contained on the CEL CD in the directory \ZFSM-201\Tools\Others\Freescale BeeKit\ in an Adobe PDF file named '**BeeKit Release Notes**'.

#### 2.3.2 *The Latest Version*

See [www.freescale.com/zigbee](http://www.freescale.com/zigbee) to download the latest version of **BeeKit**™.

(Hint: under '**Software and Tools**' search for "**BeeKit**")

#### 2.3.3 *From the CEL CD*

For simplicity, CEL has included the **BeeKit**™ installation utility on our CD. It will load Freescale **BeeKit**™, Freescale **Test Tool** and documentation; codebase files, example source and project files, and miscellaneous utilities.

The set-up file is named "**BeeKitSetup**" and can be found on the CEL CD in the directory:

\\ZFSM-201\\Tools\\Others\\Freescale BeeKit\\

Open this file and follow the instructions given.

### 3 USING **BEEKIT™** WITH THE ZFSM-201-1 MODULE


#### 3.1 ABOUT THE PLATFORM EDITOR

Platform Editor is a software utility included in **BeeKit™** that allows users to configure GPIO for their target application at a high level. Some users may choose to use it; others may wish to configure GPIO in their application software.

This document describes how to port a **BeeKit™** project to the **ZFSM-201-EVB-1** FreeStar Pro Evaluation Board with and without Platform Editor.

#### 3.2 SELECTING THE CODEBASE

Steps 1) through 6) are the same whether using Platform Editor or not:

- 1) Open **BeeKit™** by clicking on the icon [  ] on the user's desktop.
- 2) Select the targeted codebase – SMAC, MAC or BeeStack. To select the most current Codebase click on 'File' → 'Select Codebase' and select the desired codebase.
- 3) See Figure 1 to determine the Codebase being used in **BeeKit™**. For this demonstration, the selected codebase is 'ARM7 SMAC Codebase 1.0.4'.

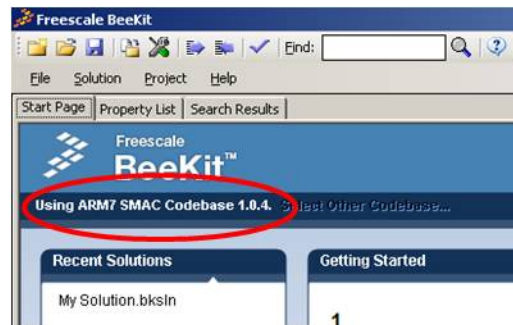


Figure 1 – Screen **BeeKit™** Codebase in Use

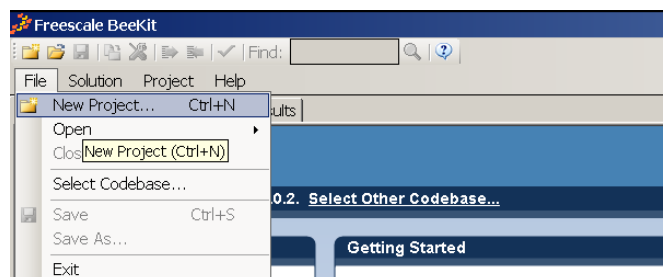


Figure 2 – Screen, **BeeKit™** Opening a New Project

### 3.3 CREATING A NEW PROJECT USING PLATFORM EDITOR

- 4) To start a new Project: Click on **'File' → 'New Project'** as shown in Figure 2.
- 5) Select the appropriate template to get your application started. In Figure 3 / Figure 4 **'Generic Application'** / **'MyWirelessApp Demo Framework'** is selected.
- 6) On the bottom of the screen, change the **'Project Name'**, **'Solution Name'**, and **'Location'** as appropriate, and click **'OK'**.

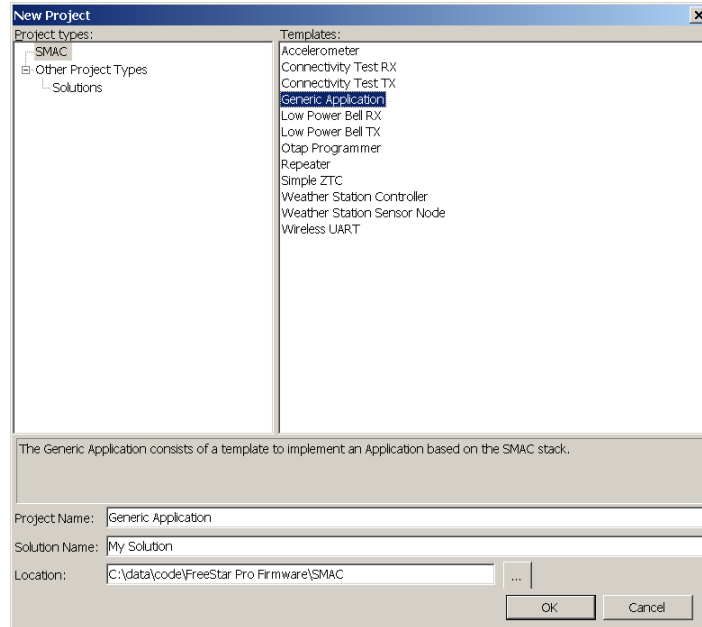


Figure 3 – Screen, *BeeKit*<sup>TM</sup> Naming and Saving a New SMAC Project

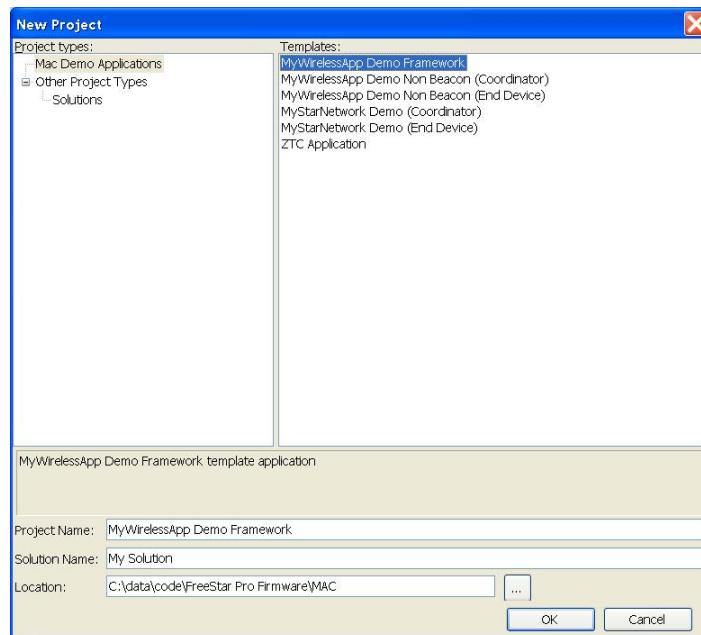
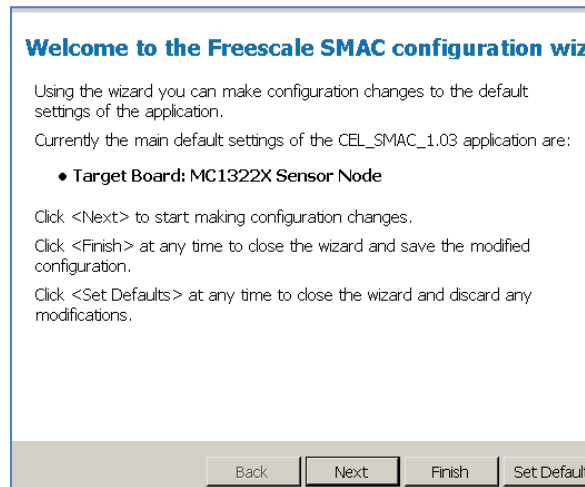


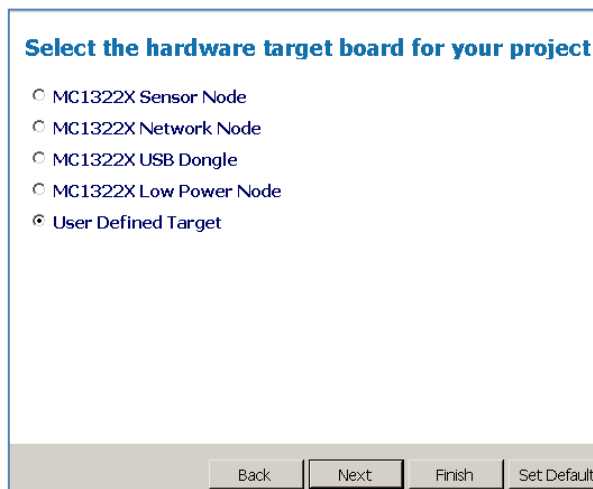
Figure 4 – Screen, *BeeKit*<sup>TM</sup> Naming and Saving a New MAC Project

The Window in Figure 5 will appear.

- 7) Click the **'Next'** button.



**Figure 5 – Screen, *BeeKit™* Welcome**



**Figure 6 – Screen, *BeeKit™* Selecting the Hardware**

The Window in Figure 6 will appear. *BeeKit™* allows the user to select a Freescale development board or custom hardware.

- 8) For the FreeStar Pro Module select **'User Defined Target'** and click **'Next'**.

The Window in Figure 7 will appear.

- 9) Click the **'Launch Platform Editor'** button.

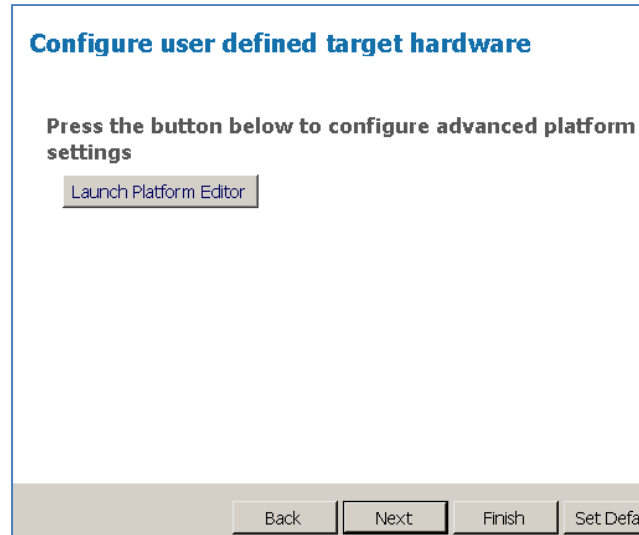


Figure 7 – Screen, *BeeKit*™ Launching Platform Editor

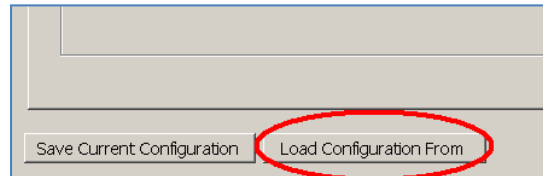


Figure 8 – Screen, *BeeKit*™ Loading Configuration

The screen in Figure 9 will appear.

- 10) If the target hardware is the **ZFSM-201-EVB-1** eval board, click the ‘**Load Configuration From**’ Button in the lower left hand corner of the window as shown in Figure 8.
- 11) Select the FreeStarPro.bkudp32 file in the directory ZFSM-201\Application Source Files\CEL Beekit Plugin v1.1\ on the CEL CD.

This file contains the hardware configuration for the **ZFSM-201-EVB-1** FreeStar Pro Evaluation Board.

If the hardware attached to the FreeStar Pro is different (or the user wants to understand the Freescale Platform Editor) continue with the following steps.

- 12) In the LEDs and Switches tab shown in Figure 9 the only change made from the default by the Configuration Load was to set the LED 4 GPIO Pin to 01. If not using the CEL FreeStar Pro Interface Board, select these settings according to the hardware on which the module is being used.



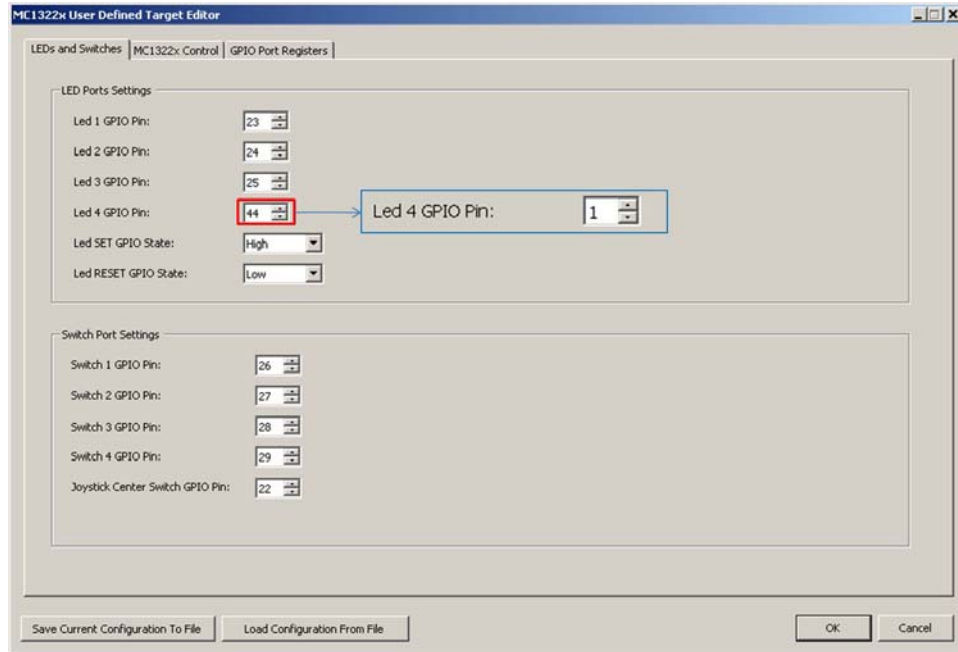
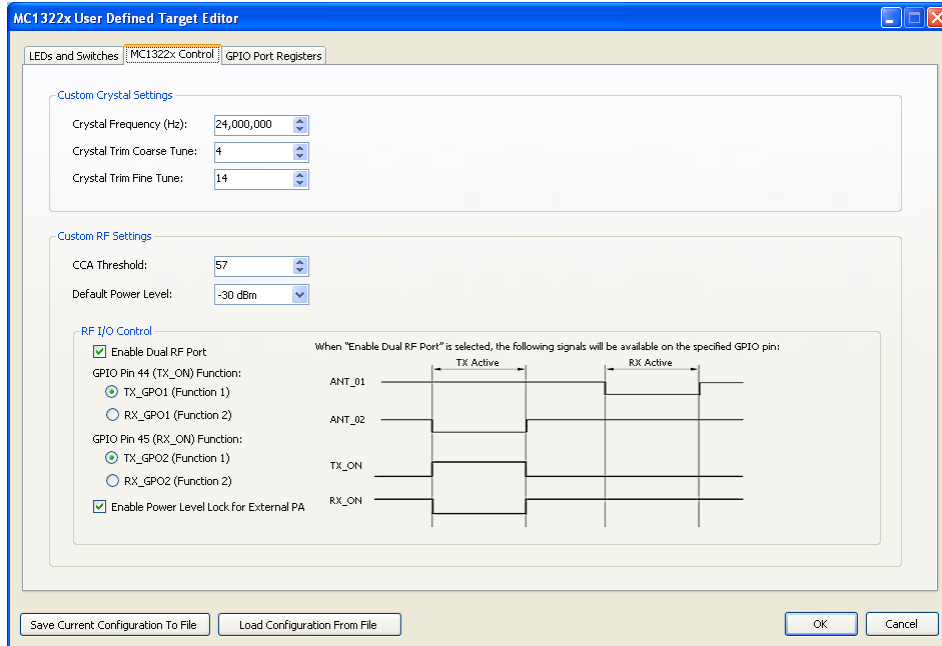


Figure 9 – Screen, *BeeKit™* LED and Switch Settings

Under the '**MC1322x Control**' Tab shown in Figure 10, confirm the following settings and make changes if necessary.

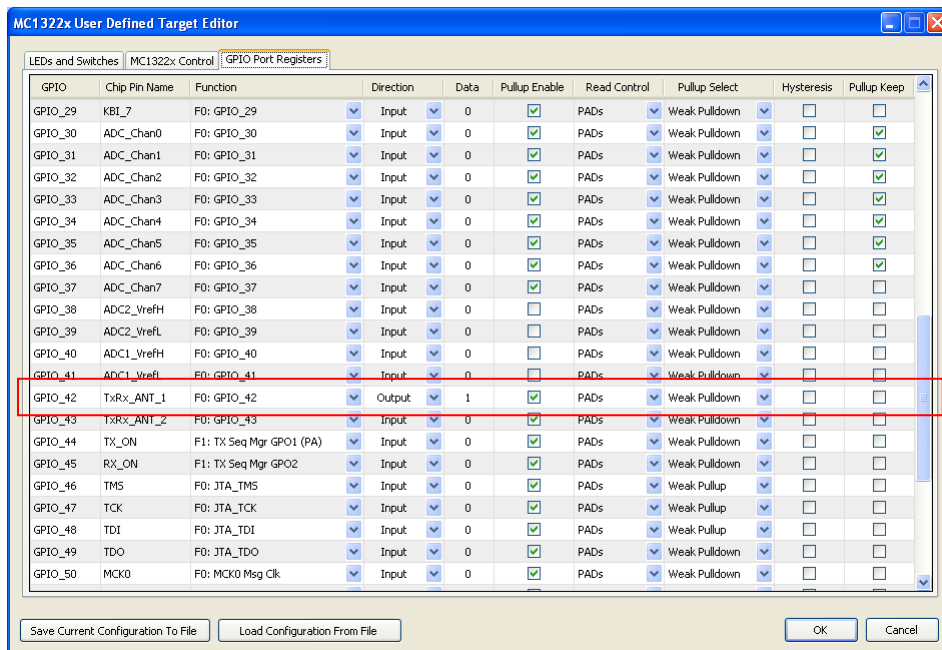
- 13) In the '**Custom Crystal Settings**' area:
  - a. Set the '**Crystal Frequency (Hz)**' to '**24,000,000**'.
  - b. Set the '**Crystal Trim Course Tune**' to '**4**'.
  - c. Set the '**Crystal Trim Fine Tune**' to '**14**'.
- 14) In the '**Custom RF Settings**' area:
  - a. Set the '**CCA Threshold**' box to '**57**'.
  - b. Set the '**Default Power Level**' to '**-30 dBm**'.
- 15) In the '**RF I/O Control**' area:
  - a. Check the '**Enable Dual RF Port**' box.
  - b. Check the boxes '**TX\_GPO1 (Function 1)**' for '**GPIO Pin 44 (TX\_ON) Function**' and '**TX\_GPO2 (Function 1)**' for '**GPIO Pin 45 (RX\_ON) Function**' as shown in Figure 10.
  - c. Check the '**Enable Power Level Lock for External PA**' box.

## FreeStar Pro BeeKit Porting Guide



**Figure 10 – Screen, *BeeKit™* Custom Crystal and RF Settings**

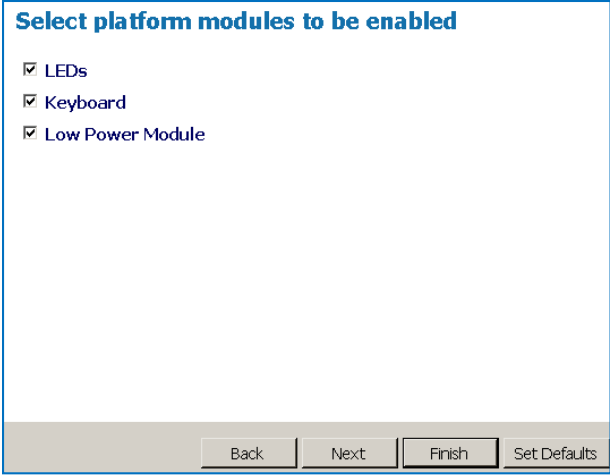
- 16) In the ‘**GPIO Port Register**’ Tab shown in Figure 11 make changes to the GPIO as necessary for custom hardware.
  - a. Confirm (and configure if necessary) ‘**GPIO\_42**’ as an ‘**Output**’ with a Data value of ‘**1**’ as shown in Figure 11.
- 17) Click ‘**OK**’ when finished.



**Figure 11 – Screen, *BeeKit™* Changes to the GPIO Port Register**

**Note:** Please check the cautions regarding **BeeKit Platform Editor** in “**ZFSM-201-KIT-1, ZFSM-201-EVB-1 Errata**” (CEL Doc #0006-00-08-04-000) if making changes to the GPIOs, RF ports, etc.

- 18) Select use of the platform modules as indicated in Figure 12. All should be selected for the FreeStar Pro Evaluation Board; otherwise select what is appropriate for custom hardware.

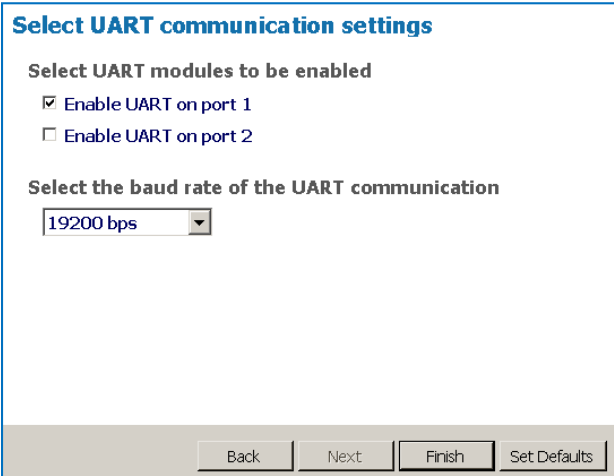


**Select platform modules to be enabled**

- ☒ LEDs
- ☒ Keyboard
- ☒ Low Power Module

Back Next Finish Set Defaults

**Figure 12 – Screen, *BeeKit*™ Selecting Platform Modules**



**Select UART communication settings**

Select UART modules to be enabled

- ☒ Enable UART on port 1
- ☐ Enable UART on port 2

Select the baud rate of the UART communication

19200 bps

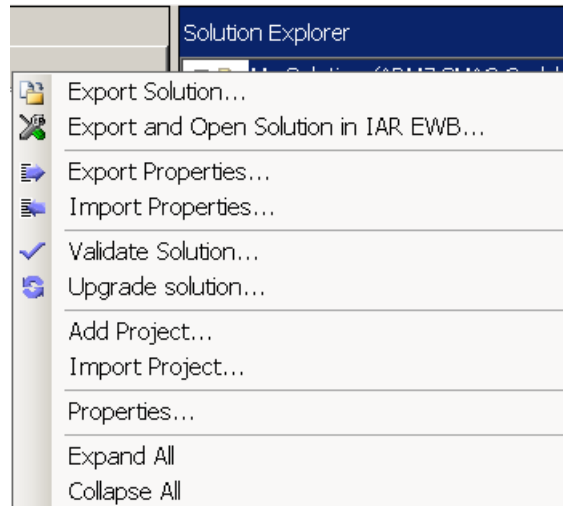
Back Next Finish Set Defaults

**Figure 13 – Screen, *BeeKit*™ Setting UART Parameters**

- 19) Enable the UART on port1 and set the baud rate to ‘**19200**’ as indicated in Figure 13 for the FreeStar Pro Evaluation board, otherwise select what is appropriate for custom hardware.
- 20) Click the ‘**Finish**’ button.

In the upper right hand corner of the **BeeKit™** GUI notice the ‘**Solutions Explorer**’ toolbar.

- 21) Right click on the solution and select the ‘**Export Solution**’ or ‘**Export and Open Solution in IAR EWB...**’ option. See Figure 14.

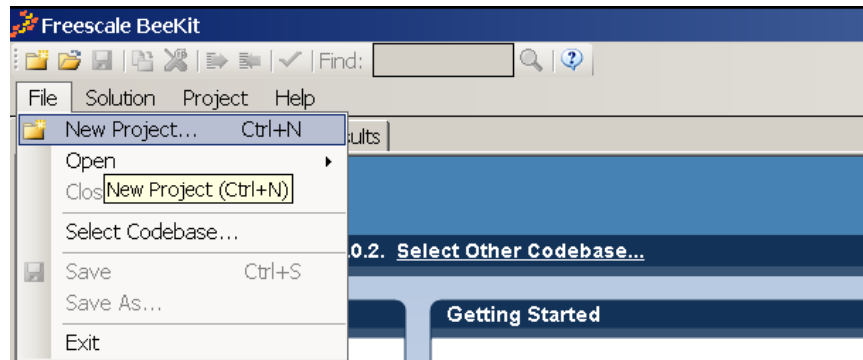


**Figure 14 – Screen, BeeKit™ Exporting the Solution**

**Note:** Please check the cautions regarding **BeeKit Platform Editor** in “**ZFSM-201-KIT-1, ZFSM-201-EVB-1 Errata**” (CEL Doc #0006-00-08-04-000) if making changes to the GPIOs, RF ports, etc.

### 3.4 CREATING A NEW PROJECT USING FREESCALE H/W TARGET (AND NOT PLATFORM EDITOR)

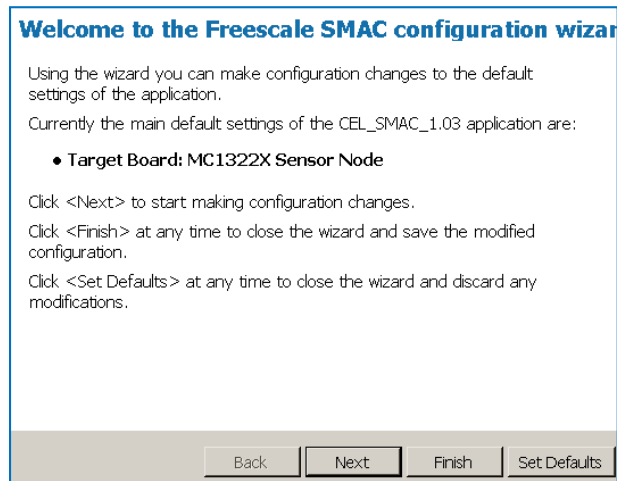
- 1) To start a new Project: Click on ‘**File**’ → ‘**New Project**’ as shown in Figure 15.



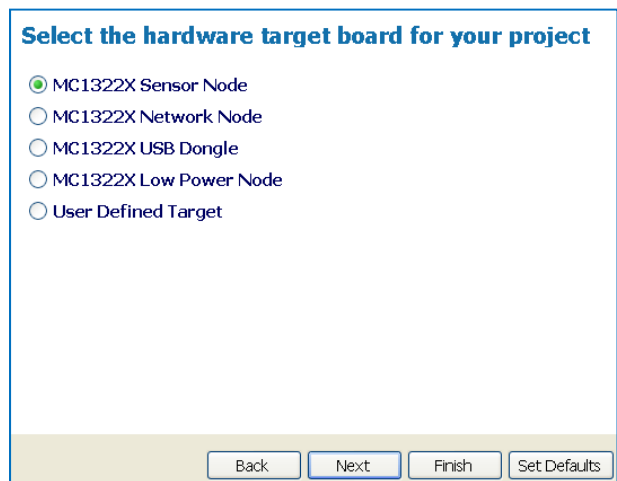
**Figure 15 – Screen, BeeKit™ New Project**

The Window in Figure 16 will appear.

- 2) Click the **'Next'** button.



**Figure 16 – Screen, *BeeKit*™ Welcome**



**Figure 17 – Screen, *BeeKit*™ Selecting Hardware**

The Window in Figure 17 will appear.

- 3) Ensure the **'MC1322x Sensor Node'** checkbox is selected. Click the **'Next'** button.

The Window in Figure 18 will appear.

- 4) Ensure the **'LEDs'**, **'Keyboard'**, and **'Low Power Module'** checkboxes are selected and click the **'Next'** button.

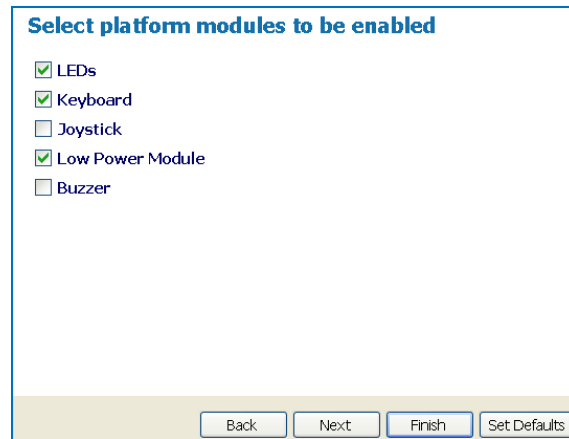


Figure 18 – Screen, *BeeKit*<sup>TM</sup> Selecting Platform Modules

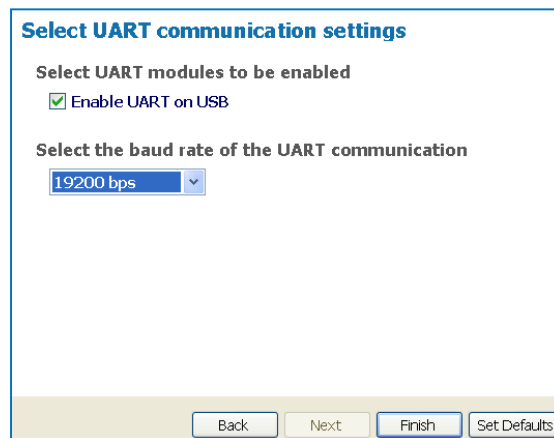


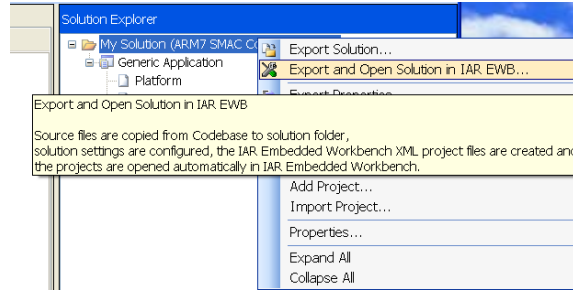
Figure 19 – Screen, *BeeKit*<sup>TM</sup> Setting UART Parameters

The Window in Figure 19 will appear.

- 5) Ensure the **'Enable UART on USB'** checkbox is selected and the baud rate is **'19200 bps'**. Click the **'Finish'** button.

In the upper right hand corner of the *BeeKit*<sup>TM</sup> GUI notice the **'Solutions Explorer'** toolbar.

- 6) Right click on the solution and select the **'Export Solution'** or **'Export and Open Solution in IAR EWB...'** option. See Figure 20.



**Figure 20 – Screen, *BeeKit™* Exporting the Solution**

## 4 REVISION HISTORY

<u>Revision</u>	<u>Date</u>	<u>Description</u>
PRELIMINARY	29Oct08	Released
A	04Feb09	Added MAC Support
B	22May09	Modified to support Freescale BeeKit™ v1.9.5